IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION of

Pawan GOYAL		Art Unit:	2161
Serial No: 10/721,602		Examiner:	C.L. Daye
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For: HIGH-PERFORMANCE PEER-TO-PEER REMOTE COPY FOR DATABASES		Attorney Ref.:	ARC920030077US1

APPEAL BRIEF

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner For Patents
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Sirs:

This Appeal Brief is submitted in connection with the Notice of Appeal submitted February 28, 2008, the final Office Action dated September 28, 2008, the Response to final Office Action submitted November 29, 2007, and the Advisory Action dated December 19, 2007, in the above-captioned application.

REAL PARTY IN INTEREST

The real party in interest is International Business Machines Corporation.

RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences that are related to the present appeal.

STATUS OF CLAIMS

Claims 1-20, 22-24 and 26 are pending and are finally rejected in the above-captioned patent application. Claims 21 and 25 have been canceled.

Claims 1-20, 22-24 and 26 are the subject of this appeal.

STATUS OF AMENDMENTS

All amendments made to the claims have been entered. There are no amendments of the claims that have not been entered.

SUMMARY OF CLAIMED SUBJECT MATTER

There are five (5) independent claims that are the subject of this appeal, independent claims 1, 7, 10, 15 and 20.

Independent claim 1 is directed to a method for asynchronously remotely copying database content changes from a primary site (primary site 101, Figure 1) to a remote site (remote site 102, Figure 1), comprising associating a sequential identification with each respective log record write and each corresponding data record write received at the primary site (paragraph [16], lines 1-3 and 10-12; and paragraph [07], lines 3-6), such that each data record write contains modifications to a page of the database (paragraph [04], lines 1-2; and paragraph [15], line 3) and each log record write contains information describing modifications to the page of the database for a corresponding data record write (paragraph [04], lines 1-2; and paragraph [15], line 3). Each respective log record write is asynchronously remotely copied from the primary site to the remote site (paragraph [07], lines 6-7; paragraph [15], lines 3-5; paragraph [16], lines 4-5, paragraph [18], lines 1-5; and Figure 2, steps 202-204). An acknowledgement is received at the primary site, such that the acknowledgement corresponds to a log record write that has been completed at the remote site (paragraph [18], lines 6-10; and Figure 2, step 205). Each data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement is remotely copied (paragraph [19], lines 1-4; Figure 2, steps 206 and 207;

paragraph [22]; and Figure 4).

Independent claim 7 is directed to a method for asynchronously remotely coping database content changes occurring at a primary site (primary site 101, Figure 1) at a remote site (remote site 102, Figure 1), comprising asynchronously receiving a log record write at the remote site, such that each respective log record received at the remote site has an associated sequential identification and a corresponding data record write (paragraph [16], lines 1-3 and 10-12; and paragraph [07], lines 3-6), such that each data record write contains modifications to a page of the database (paragraph [04], lines 1-2; and paragraph [15], line 3) and each log record write contains information describing modifications to the page of the database for a corresponding data record write (paragraph [04], lines 1-2; and paragraph [15], line 3). The received log record write is stored at the remote site (paragraph [07], line 14; paragraph [18], lines 1-5, and Figure 2, steps 202-204). An acknowledgement is sent from the remote site to the primary site when the received log record write is complete (paragraph [07], lines 8-10; paragraph [18], lines 6-10; and Figure 2, step 205). A record write is asynchronously received at the remote site from the primary site, such that each received data record write has a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement (paragraph [19], lines 1-4; Figure 2, steps 206 and 207; paragraph [22]; and Figure 4). The received data record write is stored (paragraph [07], lines 16-17.)

Independent claim 10 is directed to a storage system (distributed database system 100, Figure 1) for asynchronously remotely copying content changes stored in the storage system, comprising a primary site (primary site 101, Figure 1) and a remote site (remote site 102, Figure 1). The primary site has a storage system separately storing log records and data records (primary site 101, Figure 1). The remote site has a storage system (storage system 109, Figure 1) separately storing log records and a data records. The primary site associates a sequential identification with each respective log record write and each corresponding data record write occurring at the primary site (paragraph [16], lines 1-3 and 10-12; and paragraph [07], lines 3-6) and asynchronously remotely copies each respective log record write from the primary site to the

remote site (paragraph [07], lines 6-7; paragraph [15], lines 3-5; paragraph [16], lines 4-5, paragraph [18], lines 1-5; and Figure 2, steps 202-204), such that each data record write contains modifications to a page of the database (paragraph [04], lines 1-2; and paragraph [15], line 3) and each log record write contains information describing modifications to the page of the database for a corresponding data record write (paragraph [04], lines 1-2; and paragraph [15], line 3), such that the remote site sends to the primary site an acknowledgement corresponding to a log record write that has been completed at the remote site (paragraph [18], lines 6-10; and Figure 2, step 205), and the primary site asynchronously remotely copies to the remote site each data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement (paragraph [19], lines 1-4; Figure 2, steps 206 and 207; paragraph [22]; and Figure 4).

Independent claim 15 is directed to a primary site (primary site 101, Figure 1) of a distributed storage system (distributed database system 100, Figure 1), comprising a storage system (storage system 106, Figure 1) and a controller (controller 107, Figure 1). The storage system separately stores log records and data records, such that each data record write contains modifications to a page of the database (paragraph [04], lines 1-2; and paragraph [15], line 3) and each log record write contains information describing modifications to the page of the database for a corresponding data record write (paragraph [04], lines 1-2; and paragraph [15], line 3). The controller associates a sequential identification with each respective log record write (paragraph [16], lines 1-3 and 10-12; and paragraph [07], lines 3-6) and each corresponding data record write occurring at the primary site (paragraph [16], lines 1-3 and 10-12; and paragraph [07], lines 3-6) and asynchronously remotely copies each respective log record write from the primary site to a remote site (paragraph [07], lines 6-7; paragraph [15], lines 3-5; paragraph [16], lines 4-5, paragraph [18], lines 1-5; and Figure 2, steps 202-204), such that the controller receives an acknowledgement corresponding to a log record write that has been completed at the remote site (paragraph [18], lines 6-10; and Figure 2, step 205) and, in response, asynchronously remotely copies to the remote site each data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write

corresponding to the received acknowledgement (paragraph [19], lines 1-4; Figure 2, steps 206 and 207; paragraph [22]; and Figure 4).

Independent claim 20 is directed to a remote site (remote site 102, Figure 1) of a distributed storage system (distributed database system 100, Figure 1), comprising a storage system (storage system 109, Figure 1) and a controller (controller 110, Figure 1). The storage system separately stores log records and data records, such that each data record write contains modifications to a page of the database (paragraph [04], lines 1-2; and paragraph [15], line 3) and each log record write contains information describing modifications to the page of the database for a corresponding data record write (paragraph [04], lines 1-2; and paragraph [15], line 3). The controller asynchronously receives a log record write (paragraph [20], lines 1-2; and Figure 3, step 302) from a primary site (primary site 101, Figure 1), such that each respective log record received at the remote site has an associated sequential identification (paragraph [16], lines 1-3 and 10-12; and paragraph [07], lines 3-6) and a corresponding data record write, storing the received log record write in the storage system (paragraph [16], lines 1-3 and 10-12; and paragraph [07], lines 3-6) and sends an acknowledgement from the remote site to the primary site when the received log record write is complete (paragraph [20], lines 3-4; and Figure 3, step 304), the controller further asynchronously receives a data record write from the primary site (paragraph [21], lines 1-5; and Figure 3, step 305), such that each received data record write comprises a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement, and stores the received data record write (paragraph [19], lines 1-4; Figure 2, steps 206 and 207; paragraph [22]; and Figure 4).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-20, 22-24 and 26 stand finally rejected under 35 U.S.C. § 103(a) as being unpatentable over Yanai et al. (Yanai), U.S. Patent No. 6,502,205 B1, in view of Shomler, U.S. Patent No. 5,623,599.

ARGUMENT

I. The Rejection Based On Yanai In View Of Shomler

Applicant respectfully submits that the subject matter according to any of claims 1-20, 22-24 and 26 is patentable over Yanai in view of Shomler. In particular, Applicant respectfully submits that the Examiner has not presented a convincing line of reasoning as to why an artisan would have found the claimed subject matter of the present patent application to have been obvious in light of the teachings of Yanai and Shomler because if the combination of Yanai and Shomler is formed, the resulting device and method are not the claimed subject matter of any of claims 1-20, 22-24 and 26.

"To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). (See, also, MPEP §§ 706.02(j) and 2144.)

A. The Examiner Has Not Stated That Either Yanai Or Shomler Expressly Or Impliedly Suggest the Claimed Subject Matter

1. At page 3, lines 4-11, of the final Office Action dated September 28, 2007, the Examiner states that, regarding independent claim 1:

"However, Yanai is silent with respect to asynchronously remotely copying each respective log record write from the primary site to the remote site; receiving an acknowledgement at the primary site, the acknowledgement corresponding to a log record write that has been completed at the remote site; and asynchronously remotely copying each

data record write having a sequential identification of the log record write corresponding to the received acknowledgement."

2.   Thus, in view of the Examiner's admission that Yanai lacks many of the features of independent claim 1, it follows that the Examiner has not stated that Yanai expressly or impliedly suggests the subject matter of claim 1.

3.   Regarding independent claims 7, 10, 15 and 20, it follows that from the Examiner's respective statements regarding independent claims 7, 10, 15 and 20, it follows that the Examiner has similarly not stated that Yanai expressly or impliedly suggests the subject matter of claims 7, 10, 15 and 20. (See final Office Action dated September 28, 2007, page 5, line 14, through page 6, line 14; page 6, line 15, through page 7, line 17; page 8, line 13, through page 9, line 11; and page 10, line 8, through page 11, line 7.)

4.   Further, the Examiner has not stated that Shomler expressly or impliedly suggests the subject matter of independent claims 1, 7, 10, 15 and 20.

5.   Thus, the Examiner has not stated that either Yanai or Shomler expressly or impliedly suggests the claimed subject matter of independent claims 1, 7, 10, 15 and 20.

B.   The Examiner Has Not Established A Convincing Line Of Reasoning As To Why An Artisan Would Have Found The Claimed Subject Matter To Have Been Obvious In Light Of The Teachings Of The References

1.   Accordingly, the Examiner relies on a combination of Yanai and Shomler to form the subject matter of claims 1-20, 22-24 and 26.

2.   Regarding independent claim 1, Applicant respectfully submits that neither Yanai nor Shomler disclose or suggest a method comprising asynchronously remotely copying each respective log record write from the primary site to the remote site; receiving an acknowledgement at the primary site, such that the acknowledgement corresponds to a log record write that has been completed at the remote site; and asynchronously remotely copying each data record write having a sequential identification that is prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement.

3.   The Examiner admits that Yanai is silent regarding most of the subject matter of independent claim 1. In particular, the Examiner admits that "Yanai is silent with respect to asynchronously remotely copying each respective log record write from the primary site to the remote site; receiving an acknowledgement at the primary site, the acknowledgement corresponding to a log record write that has been completed at the remote site; and asynchronously remotely copying each data record write having a sequential identification that is prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement." (See final Office Action dated September 28, 2007, page 4, lines 4-11.)

4.   The Examiner has not alleged that Yanai suggests these aspects of claim 1.

5.   Consequently, if the combination of Yanai in view of Shomler is to provide these particular aspects of independent claim 1, then Shomler must disclose or suggest these aspects.

6.   Regarding Shomler, Applicant respectfully submits that Shomler does not disclose or suggest a method comprising:

asynchronously remotely copying each respective log record write from the primary site to the remote site;

receiving an acknowledgement at the primary site, such that the acknowledgement corresponds to a log record write that has been completed at the remote site; and

asynchronously remotely copying each data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement.

7.   The Examiner asserts that column 4, lines 10-17 of Shomler discloses asynchronously remotely copying each respective log record write from the primary site to the remote site. (See final Office Action dated September 28, 2007, page 3, lines 11-13.)

8.   Applicant respectfully submits that column 4, lines 10-17 of Shomler actually discloses that to perform asynchronous copying, a <u>sequence</u> of data updates that is

determinable at a local site must be communicated to a remote site and the remote site must be able to use the <u>sequence</u> to control updating at the remote site.

9. Thus, contrary to the Examiner's assertion, column 4, lines 10-17 of Shomler does not disclose anything about a <u>log record write</u> that is copied from a primary site to a remote site.

10. Further, because column 4, lines 10-17 of Shomler does not disclose anything about a <u>log record write</u> that is copied from a primary site to a remote site, it follows that this portion of Shomler does not suggest anything about asynchronously copying a <u>log record write</u> from a primary site to a remote site.

11. Moreover, Applicant respectfully submits that the Examiner's assertion that column 4, lines 10-17 of Shomler discloses asynchronously remotely copying each respective log record write from the primary site to the remote site is inconsistent with the Examiner's assertion at page 14, lines 3-5, of the final Office Action dated September 28, 2007, in which the Examiner states that "Shomler was not relied upon for the disclosure of the log record write containing information describing to [sic] modifications to the page of the database for a corresponding data record write."[1]

12. Accordingly, because Shomler does not disclose or suggest a log record write containing information describing modifications to the page of the database for a corresponding data record write, as admitted by the Examiner at page 14, lines 3-5, of the final Office Action dated September 28, 2007, it further logically follows that Shomler cannot disclose or suggest "receiving an acknowledgement at the primary site, the acknowledgement corresponding to a log record write that has been completed at the remote site," as recited by claim 1.

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1 Notably, the Examiner's admission at page 14, lines 3-5, of the final Office Action dated September 28, 2007, is fully consistent with Applicant's assertion that column 4, lines 10-17, of Shomler does not disclose or suggest anything about a log record write that is copied from a primary site to a remote site. The Examiner's inconsistent assertions raise an interesting question: If Yanai is silent regarding the concept of asynchronously copying a log record write from a primary site to a remote site, and Shomler is not relied on for the disclosure of a log record write containing information describing modifications to a page of a database for a corresponding data record write (and Shomler discloses nothing about asynchronously copying a log record write from a primary site to a remote site), then from how does the Examiner arrive at the concept of asynchronously copying a log record write from a primary site to a remote site for the basis of the rejection? Plainly, there is a gap in the Examiner's line of reasoning.

13.   Further still, in view of the Examiner's admission at page 14, lines 3-5, of the final Office Action dated September 28, 2007, Applicant respectfully submits that it logically follows that Shomler cannot disclose or suggest "asynchronously remotely copying each data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement," also as recited by claim 1.

14.   Consequently, it follows that based on the Examiner's admissions and inconsistent statements, neither Yanai nor Shomler disclose or suggest:

asynchronously remotely copying each respective log record write from the primary site to the remote site;

receiving an acknowledgement at the primary site, the acknowledgement corresponding to a log record write that has been completed at the remote site; and

asynchronously remotely copying each data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement.

15.   As support for the Examiner's line of reasoning, the Examiner cites portions of Shomler that relate to an improvement to an asynchronous copy operation system disclosed by U.S. Patent Application Serial No. 07/992,219 (now U.S. Patent No. 5,577,222 to Micka et al.).   In particular, the Examiner cites column 9, lines 33-39, and column 10, lines 34-45, of Shomler as relating to the subject matter of claim 1.

16.   Applicant respectfully submits that Shomler discloses that the Micka et al. system uses a sequence checkpoint for maintaining sequence integrity with asynchronous information packet presentation.   In that regard, Shomler discloses that the Micka et al. system uses a set of information packets that are grouped together and processed as a single sequence unit.   The Micka et al. sequence unit (i.e., the set of information packets that are grouped together) is interpreted and processed as though all or none of the writes in the group have occurred.   (See Shomler, column 7, lines 22-38, and column 9, lines 33-39.)   The checkpoint group of information packets is assigned a checkpoint sequence number and sent to a secondary

process location where all the data updates represented in the checkpoint group are treated as a single unit for sequence integrity. (See Shomler, column 8, lines 1-3.) According to Shomler, changed data for all the information packets must be received before any data for an information packet in the group is written to a secondary DASD (Direct Access Storage Device) copy. (See Shomler, column 8, lines 1-9.) Thus, Shomler discloses that the Micka et al. system allows for a situation in which the information packets forming a group might not be complete and written as a secondary DASD copy before a subsequently queued group of information packets is complete and written as a secondary DASD copy.

17.   Applicant respectfully notes that the Micka et al. system thus does not "asynchronously remotely copying each data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the claimed received acknowledgement," as recited by claim 1, because according to Micka et al. the information packets forming a group might not be complete and written as a secondary DASD copy before a subsequently queued group of information packets is complete and written as a secondary DASD copy.

18.   Shomler further discloses a situation in which there might be some transactions that are so important that the transactions must be communicated before the total number of transactions within a sequence checkpoint (i.e., a group) is complete. (See Shomler, column 8, lines 16-19.) Shomler demonstrates that for such a situation the Micka et al. system the overall flow of the (asynchronous) transactions would be disrupted. (See Shomler, column 8, line 33, through column 9, line 5.)

19.   Shomler purports to provide an improvement to the Micka et al. asynchronous copy operation system and the disclosed disruptive situation. (See Shomler, column 9, lines 6-8, and column 11, lines 27-30.)

20.   Taking a closer look at the Shomler improvement on which the Examiner relies for the Examiner's line of reasoning for the present rejection, Shomler discloses that an application process 12′ in the Shomler system creates a marker request event 4a upon the

completion of a local write operation 4. The marker request event 4a is signaled to copy process 16'.

21.   It should be noted that marker request event 4a is disclosed by Shomler to be subsequent to: (i) application process 12' performing an I/O write to DASD subsystem 14' (indicated at 2 in Shomler Figure 5); (ii) DASD subsystem 14' sending a message token to the copy process 16' in response to recognizing that a write to a storage area that is to be copied is about to be performed (indicated at 3 (and 5) in Shomler Figure 5; and (iii) completion of the process application's I/O write operation (indicated at 4 in Shomler Figure 5). Copy process 16' arranges the message token received at 5 in the correct sequence relative to other copy events in the system. (See Shomler, column 9, lines 18-25.)

22.   In response to marker request event 4a, copy process 16' creates a marker message token and inserts the marker message token into the message stream that is moved to secondary subsystem 18' (indicated at 6 in Shomler Figure 5). At secondary subsystem 18', the message marker token is recorded into the control info log and pending write queue in the same manner as other message tokens (indicated at 4b in Shomler Figure 5). (See Shomler, column 9, lines 26-32.) When the group (recall the Micka et al. sequence unit of grouped information packets) that encompasses the marker synchronize request is complete and ready to the written to the secondary DASD subsystem, the secondary remote copy data mover returns an acknowledgement to the primary subsystem that the marker operation is complete, that is, that the secondary subsystem has secured all the secondary write data that is preceded by the marker. (See Shomler, column 9, lines 33-39.)

23.   Applicant respectfully submits that the acknowledgement returned to the primary subsystem is not an acknowledgement that corresponds to a log record write that has been completed at the remote site. Instead, the acknowledgement disclosed by Shomler corresponds to a data record write.

24.   Thus, Shomler does not disclose or suggest "receiving an acknowledgement at the primary site, such that the acknowledgement corresponds to a log record write that has been completed at the remote site," as recited by claim 1.

25.   Figure 6 of Shomler shows an exemplary pending write queue at a secondary subsystem 18' depicting a synchronizing MARKER TOKEN 126 in a pending write queue. Notably, Figure 6 shows DATA BEING MARKED 122 inserted in the pending write queue prior to the point in which synchronizing MARKER TOKEN 126 has been inserted into the queue. Shomler indicates that the marker synchronize request (i.e., MARKER TOKEN 126) causes no secondary DASD copy write. (See Shomler, column 9, line 67, through column 10, line 1.) In fact, a message MARKER TOKEN 126 that is inserted into the pending write queue has no corresponding update write data, and will necessarily have a later time stamp and higher global event sequence number than tokens for any preceding I/O write operation. (See Shomler, column 9, lines 51-58, emphasis added.)

26.   Applicant respectfully submits that other notable items depicted in Figure 6 of Shomler include (i) a depiction of UPDATED DATA in the pending queue as shaded blocks, and (ii) some later-in-time UPDATED DATA in the pending queue before some earlier-in-time UPDATED DATA. (See Shomler, column 10, lines 1-8.) Thus, no indication of UPDATED DATA by a shaded block indicates that no UPDATED DATA has yet been received and inserted into the pending queue. Recalling that the Micka et al. system allows for a situation in which the information packets forming a group containing a marker token might not be complete before a subsequently queue group of information packets is complete, Figure 6 confirms that the Shomler system also allows for such a similar situation. That is, Shomler allows for a situation in which information packets forming a group and containing a marker token might not be complete and written as a secondary DASD copy before a subsequently queued group of information packets (group) is complete and written as a secondary DASD copy. As disclosed by Shomler, an incomplete group will accordingly not be processed until the group is complete even though the group might contain a marker token. (See Shomler, column 8, lines 1-9.)

27.   Thus, Applicant respectfully submits that it is plain that Shomler MARKER TOKEN 126 cannot be the claimed log record write of claim 1 because MARKER TOKEN 126 does not contain information describing modifications to the page of the database

for a corresponding data record write. (See Shomler, column 9, lines 51-58, and column 9, line 67, through column 10, line 1.)

28. This aspect of the Shomler MARKER TOKEN is as expected because Shomler does not disclose or suggest anything about a log record write that is copied from a primary site to a remote site.

29. Moreover, the Examiner admits as much at page 14, lines 3-5, of the final Office Action dated September 28, 2007.

30. Further, the Examiner's characterization of the operation of Shomler is without basis because Shomler does not disclose or suggest asynchronously remotely copying each data record write having a sequential identification that is only prior to or equal to the sequential identification of the claimed log record write corresponding to the received acknowledgement.

31. As demonstrated in connection with Figure 6, Shomler allows for a situation in which information packets forming a group and containing a marker token might not be complete and written as a secondary DASD copy before a subsequently queued group of information packets is complete and written as a secondary DASD copy.

32. The Examiner responds to Applicant's argument that neither Yanai nor Shomler disclose a method comprising at least asynchronously remotely copying each data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement by asserting that column 1, lines 14-19 and 50-59, of Shomler

> details the purpose of the Shomler invention, which is to focus on the asynchronous remote data duplexing (i.e., copying). This is achieved through sequence integrity, which maintains the consistency of the arrangement of the write updates from one site to another site. Thereby, [sic] teaching the features of asynchronously remotely copying each data record write having a sequential id. (See final Office Action dated September 28, 2007, page 12, line 10, through page 13, line 1.)

33.   Applicant respectfully submits that, contrary to this assertion by the Examiner, column 1, lines 14-19 and 50-59, of Shomler does not disclose that sequence integrity "maintains the consistency of the arrangement of the write updates from one site to another site" by "teaching the features of asynchronously remotely copying each data record write having a sequential id." In actuality, column 1, lines 14-19 and 50-59, of Shomler discloses the general concept of sequence integrity in an asynchronous copy system can be accomplished <u>by communications</u> between primary and secondary DASD subsystems. That is, Shomler generally discloses that for an asynchronous copy system "a system at a primary site can determine the sequence among different update write operations among all DASD subsystems at the primary site and communicate that information to the DASD subsystem at the remote site." (See Shomler, column 1, lines 50-56.)

34.   Shomler also generally discloses that the sequence information from the primary site is used by the secondary site "to control the application of update data to the secondary DASD data copy." (See Shomler, column 1, lines 56-59.)

35.   Accordingly, column 1, lines 14-19 and 50-59, of Shomler does not disclose or suggest a "data record write having sequential id" as urged by the Examiner.

36.   Using the "read on" principle immediately after Shomler's general statement relating to the concept of sequence integrity being accomplished by communications between primary and secondary systems (and notably immediately after the range of the Examiner's cite), Shomler states that "[k]nown asynchronous copy systems are described below." (See Shomler, column 1, lines 59-60.) Shomler describes a number of known asynchronous copy systems that achieve sequence integrity by communications between primary and secondary systems. None of the known asynchronous copy systems described by Shomler is specifically disclosed to include a "data record write having sequential id."

37.   This is significant for two reasons: (i) as already mentioned, none of the known asynchronous copy systems described by Shomler are specifically disclosed to include a "data record write having sequential id"; and (ii) the Examiner appears to ignore the continued disclosure of Shomler (i.e., the "read on" principle) that does not specifically identify which, if

any, of the disclosed known asynchronous copy systems disclose a "data record write having sequential id."

38.   Thus, column 1, lines 14-19 and 50-59, of Shomler on which the Examiner relies for the conclusion of a "data record write having sequential id" discloses nothing about a "data record write having sequential id" and suggests nothing about a "data record write having sequential id."

39.   Accordingly, Applicant respectfully submits that the Examiner's conclusion of "each data record write having a sequential id" is without basis.

40.   The Examiner then argues that "[n]ext Shomler states ... ." (See final Office Action dated September 28, 2007, page 13, line 1.)

41.   Applicant respectfully submits that the Examiner's use of the word "next" distorts the actual disclosure of Shomler and serves to hide the gaps in the Examiner's line of reasoning.   That is, based on the way the Examiner uses the word "next," one would easily conclude that immediately after Shomler's general statements regarding achieving sequence integrity by communications between primary and secondary systems, Shomler discusses acknowledgement messages between secondary and primary systems.

42.   In actuality, the particular portion of Shomler that is relied on by the Examiner as being "next" is some nine columns later and specifically relates to an alternative Shomler embodiment that uses acknowledgements in connection with a data mover at the primary site and the secondary site that operates in a single system. (Applicant has previously addressed the relevancy of the context of the disclosed Shomler acknowledgements with respect to the subject matter of claim 1 above in paragraphs 6-14 under heading B.)

43.   In response to Applicant's demonstration that the Shomler MARKER TOKEN 126 is not the claimed log record write, the Examiner cites *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981) and *In re Merck & Co., Inc.* 800 F.2d 1091, 231 USPQ 375 (Fed.Cir. 1986) for the proposition of law that one cannot show nonobviousness by attacking references individually where the rejections are based on combination of references. In this regard, the Examiner asserts that

Shomler was not relied upon for the disclosure of the log record write containing information describing to [sic] modifications to the page of the database for a corresponding data record write. In contrast, Yanai was relied upon for the disclosure of such limitation and is cited in the action above. As such, it is the combination of the two (2) references, which make up the invention as a whole. (See final Office Action dated September 28, 2007, page 14, lines 3-7.)

      44.   Applicant respectfully submits that in view of the proposition of law asserted by the Examiner, Applicant queries that if

      (i) the Examiner admits that Yanai is silent with respect to a significant portion of the claimed subject matter of claim 1 (see paragraph 3 under heading B),

      (ii) has not demonstrated that Shomler discloses the same features of claim 1 for which Yanai is admittedly silent (see paragraphs 6-42 under heading B), and

      (iii) admits that Shomler is not relied on for the claimed log record write (see paragraph 43 under heading B),

      then how does the combination of Yanai and Shomler make up the claimed subject matter as a whole? It would seem that the Examiner's line of reasoning is based on the fact that an artisan would ignore the true context of Shomler to find the subject matter of claim 1 to have been obvious in light of the teachings of Yanai and Shomler. But then, why rely on Shomler?

      45.   Further, Applicant respectfully submits that Yanai and Shomler do not need to be attacked individually because the Examiner has not presented a convincing line of reasoning as to why an artisan would have found the subject matter of claim 1 to have been obvious in light of the teachings of Yanai and Shomler. That is because the Examiner's line of reasoning comprises admissions by the Examiner that both Yanai and Shomler lack the same features of the claimed subject matter, conclusions by the Examiner about the disclosure of Shomler that are without basis, and inconsistent statements by the Examiner.

      46.   Thus, Applicant respectfully submits that claim 1 is allowable over Yanai in view of Shomler because the Examiner has not shown that either Yanai or Shomler expressly

or impliedly suggests the claimed subject matter, and the Examiner has not presented a convincing line of reasoning as to why an artisan would have found the claimed subject matter to have been obvious in light of the teachings of Yanai and Shomler. It follows that claims 2-6, which incorporate the features of claim 1, are each allowable over Yanai in view of Shomler for at least the same reasons that claim 1 is considered allowable.

47.   Regarding claim 7, Applicant respectfully submits that the subject matter of claim 7 is allowable over Yanai in view of Shomler for reasons that are similar to the reasons that claim 1 is considered allowable over Yanai in view of Shomler. It follows that claims 8 and 9, which incorporate the features of claim 7, are each allowable over Yanai in view of Shomler for at least the same reasons that claim 7 is considered allowable.

48.   Regarding claim 10, Applicant respectfully submits that the subject matter of claim 10 is allowable over Yanai in view of Shomler for reasons that are similar to the reasons that claim 1 is considered allowable over Yanai in view of Shomler. It follows that claims 11-14, which incorporate the features of claim 10, are each allowable over Yanai in view of Shomler for at least the same reasons that claim 10 is considered allowable.

49.   Regarding claim 15, Applicant respectfully submits that the subject matter of claim 15 is allowable over Yanai in view of Shomler for reasons that are similar to the reasons that claim 1 is considered allowable over Yanai in view of Shomler. It follows that claims 16-19, which incorporate the features of claim 15, are each allowable over Yanai in view of Shomler for at least the same reasons that claim 15 is considered allowable.

50.   Regarding claim 20, Applicant respectfully submits that the subject matter of claim 20 is allowable over Yanai in view of Shomler for reasons that are similar to the reasons that claim 1 is considered allowable over Yanai in view of Shomler. It follows that claims 22-24 and 26, which incorporate the features of claim 20, are each allowable over Yanai in view of Shomler for at least the same reasons that claim 20 is considered allowable.

51.   Thus, Applicant respectfully submits that it is only by impermissible hindsight that the Examiner is able to reject claims 1-20, 22-24 and 26 based on the Yanai in view of Shomler. The Examiner has not shown that either Yanai or Shomler expressly or

impliedly suggests the claimed subject matter. Moreover, the Examiner has not presented a convincing line of reasoning as to why an artisan would have found the claimed subject matter to have been obvious in light of the teachings of Yanai and Shomler. In this regard, the method and the system resulting from the combination of Yanai in view of Shomler are simply not the claimed subject matter. Further, the Examiner cannot, on one hand, assert that Shomler discloses a log record write, and then later assert that Shomler does not disclose a log record write. Accordingly, it is only by using Applicant's disclosure as a template that the Examiner is able to select particular features of Yanai and Shomler through a hindsight reconstruction of Applicant's claims to make the rejection.

52.   Consequently, Applicant respectfully requests that the Examiner withdraw this rejection and allow claims 1-20, 22-24 and 26.
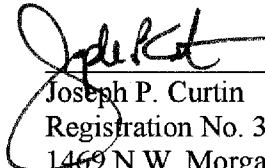
CONCLUSION

In view of the above arguments, it is urged that the present application is in condition for allowance.

It is requested that this application be passed to issue with claims 1-20, 22-24 and 26.

Respectfully submitted,

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CLAIMS APPENDIX

1.   (previously presented) A method for asynchronously remotely copying database content changes from a primary site to a remote site, the method comprising:

associating a sequential identification with each respective log record write and each corresponding data record write received at the primary site, each data record write containing modifications to a page of the database and each log record write containing information describing modifications to the page of the database for a corresponding data record write;

asynchronously remotely copying each respective log record write from the primary site to the remote site;

receiving an acknowledgement at the primary site, the acknowledgement corresponding to a log record write that has been completed at the remote site; and

asynchronously remotely copying each data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement.

2.   (original) The method according to claim 1, wherein the sequential identification is a monotonically increasing identification number.

3.   (original) The method according to claim 1, wherein the sequential identification is a monotonically increasing time-stamp identification.

4.   (original) The method according to claim 1, wherein a log record write is asynchronously remotely copied from the primary site to the remote site before a data record write is asynchronously remotely copied from the primary site to the remote site.

5.   (original) The method according to claim 1, wherein each log record write is a log block and each data record write is a data block write.

6. (original) The method according to claim 1, further comprising:

asynchronously receiving a log record write at the remote site;

storing the received log record write at the remote site;

sending an acknowledgement from the remote site to the primary site when the received log record write is complete;

asynchronously receiving a data record write at the remote site from the primary site; and

storing the received data record write.

7. (previously presented) A method for asynchronously remotely coping database content changes occurring at a primary site at a remote site, the method comprising:

asynchronously receiving a log record write at the remote site, each respective log record received at the remote site having an associated sequential identification and a corresponding data record write, each data record write containing modifications to a page of the database and each log record write containing information describing modifications to the page of the database for a corresponding data record write;

storing the received log record write at the remote site;

sending an acknowledgement from the remote site to the primary site when the received log record write is complete;

asynchronously receiving a data record write at the remote site from the primary site, each received data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement; and

storing the received data record write.

8. (original) The method according to claim 7, wherein the sequential identification is a monotonically increasing identification number.

9.   (original) The method according to claim 7, wherein the sequential identification is a monotonically increasing time-stamp identification.

10.   (previously presented) A storage system for asynchronously remotely copying content changes stored in the storage system, the system comprising:

a primary site having a storage system separately storing log records and data records;

a remote site having a storage system separately storing log records and a data records,

the primary site associating a sequential identification with each respective log record write and each corresponding data record write occurring at the primary site and asynchronously remotely copying each respective log record write from the primary site to the remote site, each data record write containing modifications to a page of the database and each log record write containing information describing modifications to the page of the database for a corresponding data record write, the remote site sending to the primary site an acknowledgement corresponding to a log record write that has been completed at the remote site, and the primary site asynchronously remotely copying to the remote site each data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement.

11.   (original) The system according to claim 10, wherein the sequential identification is a monotonically increasing identification number.

12.   (original) The system according to claim 10, wherein the sequential identification is a monotonically increasing time-stamp identification.

13.   (original) The system according to claim 10, wherein a log record write is

asynchronously remotely copied from the primary site to the remote site before a data record write is asynchronously remotely copied from the primary site to the remote site.

14. (original) The method according to claim 10, wherein each log record write is a log block and each data record write is a data block write.

15. (previously presented) A primary site of a distributed storage system, the system comprising:

a storage system separately storing log records and data records, each data record write containing modifications to a page of the database and each log record write containing information describing modifications to the page of the database for a corresponding data record write; and

a controller associating a sequential identification with each respective log record write and each corresponding data record write occurring at the primary site and asynchronously remotely copying each respective log record write from the primary site to a remote site, the controller receiving an acknowledgement corresponding to a log record write that has been completed at the remote site and, in response, asynchronously remotely copying to the remote site each data record write having a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement.

16. (original) The system according to claim 15, wherein the sequential identification is a monotonically increasing identification number.

17. (original) The system according to claim 15, wherein the sequential identification is a monotonically increasing time-stamp identification.

18. (original) The system according to claim 15, wherein a log record write is asynchronously remotely copied from the primary site to the remote site before a data record

write is asynchronously remotely copied from the primary site to the remote site.

19.   (original) The method according to claim 15, wherein each log record write is a log block and each data record write is a data block write.

20.   (previously presented) A remote site of a distributed storage system, the system comprising:

a storage system separately storing log records and data records, each data record write containing modifications to a page of the database and each log record write containing information describing modifications to the page of the database for a corresponding data record write,

a controller asynchronously receiving a log record write from a primary site, each respective log record received at the remote site having an associated sequential identification and a corresponding data record write, storing the received log record write in the storage system and sending an acknowledgement from the remote site to the primary site when the received log record write is complete, the controller further asynchronously receiving a data record write from the primary site, each received data record write comprising a sequential identification that is only prior to or equal to the sequential identification of the log record write corresponding to the received acknowledgement, and storing the received data record write.

21.   (canceled)

22.   (original) The remote site according to claim 20, wherein the sequential identification is a monotonically increasing identification number.

23.   (original) The remote site according to claim 20, wherein the sequential identification is a monotonically increasing time-stamp identification.

24.   (original) The remote site according to claim 20, wherein a log record write is asynchronously remotely copied from the primary site to the remote site before a data record write is asynchronously remotely copied from the primary site to the remote site.

25.   (canceled)

26.   (original) The remote site according to claim 20, wherein each log record write is a log block and each data record write is a data block write.

EVIDENCE APPENDIX

No Additional Evidence Submitted

RELATED PROCEEDINGS APPENDIX

No related proceedings